New insights into long-term paleoceanographic changes during the late Paleocene to middle Eocene interval from the NE Atlantic

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The early Paleogene is characterized by a greenhouse climate punctuated by at least two transient hyperthermal events (< 200 ky) introducing the longer lasting Early Eocene Climatic Optimum (EECO, 52 – 54 Ma). This episode of warmth is subsequently followed by a general long-term cooling trend culminating in the Eocene-Oligocene glaciation. A number of more or less detailed foraminiferal $\delta^{18}O$ and $\delta^{13}C$ long-term records for the late Paleocene to middle Eocene interval have been published during the last two decades, yet most of them are from the Southern and Pacific oceans.

Here we present new detailed planktic and benthic foraminiferal isotope records from DSDP Site 401, which is situated on the North Biscay margin and represents thereby one of the most northern scientific drill sites providing pelagic carbonates of Paleocene to middle Eocene age. The study interval has been investigated with respect to the $\delta^{18}O$ and $\delta^{13}C$ composition of planktic (*Acarinina*, *Hantkenina*, *Morozovella*, *Morozovelloides* and *Subbotina*) and epibenthic foraminifera (*Cibicidoides* and *Nuttallides truempyi*). A fairly good core recovery in combination with well preserved foraminiferal calcite makes this site suitable for correlations and comparison with previously published long-term records from the Pacific Ocean (e.g., Allison Guyot, Shatsky Rise) and the Southern Ocean (Maud Rise). Benthic foraminiferal data of both $\delta^{18}O$ and $\delta^{13}C$ are well in line with the multi-site compilation of Zachos et al. (2008, Nature) showing the well know long-term shift towards heavier $\delta^{18}O$ values. By contrast, surface dwelling planktic foraminifera don't show any indication for a middle Eocene cooling, while subsurface dwelling taxa display a minor increase in $\delta^{18}O$. This again raises doubt about a general surface water cooling as already proposed by Pearson et al. (2007, Geology) based on data from Tanzania.